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10/081,796	02/22/2002	Dean J. Denning	SC91135A D01	1748

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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT PAPER NUMBER

1753

DATE MAILED: 09/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/081,796

Applicant(s)

DENNING ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 33-37 and 45-53 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 33-37 and 45-53 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3. 6) ☐ Other: .

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 33, 34, 37, 48 and 49 are rejected under 35 U.S.C. 102(b) as being anticipated by Hasegawa et al. (U.S. Pat. 5,271,788) (Evidence document Yamagami et al. (U.S. Pat. 5,316,645)).

Hasegawa et al. teach that conventionally, a dry etching apparatus, ***a thin-film forming apparatus and the like for use in manufacture of semiconductor elements are known as a magnetron plasma processing apparatus.*** In this apparatus, plasma is generated in a process chamber of the apparatus to perform a desired operation such as etching and ***thin-film formation***, by the action of ions, radicals, electrons, etc. contained in the plasma. (Column 1 lines 11-19)

Problems are associated with magnetron plasma etching apparatus, ***magnetron plasma sputtering apparatus***, plasma CVD apparatus and the like which include low cycloid movement of electrons near the periphery, the density of electrons increases on the periphery of the wafer which damages the wafer and the ion density is increased in a region near the periphery of the wafer more than in a region above the near central part of wafer. (Column 1 lines 59-68; Column 2 lines 1-27)

FIG. 8 shows an enlarged part of the apparatus shown in FIG. 7. As is apparent from FIG. 8, the second embodiment differs from the first embodiment in that **the conductive ring 22 is arranged on an insulating ring 32C**. The insulating ring 32C has an outer diameter which is substantially the same as that of the support wall 32b of the lower chamber portion 32 and an inner diameter which is substantially the same as that of the ceramic insulation member 16. (Column 7 lines 56-64)

**The conductive ring 22 electrically contacts the susceptor 12 and is insulated from the lower chamber portion, as in the first embodiment. The ring 22 is formed of material whose electrical resistance is lower than that of an object to be processed.** For example, nonmetallic SiC, carbon, and the like can be used for the silicon wafer 10. The outer diameter of the ring 22 is larger than the diameter of the first susceptor 12 and that of the wafer 10. Consequently, the same advantage as that of the first embodiment can be obtained from the second embodiment. (Column 65-68; Column 8 lines 1-7)

**The conductive ring 22 is formed of carbon in the above embodiments, but can be formed of other conductive material such as SiC and Al.** Since, however, the conductive ring 22 is formed to prevent electrons from being injected from plasma into the wafer 10, it is desirable that the electrical resistance of the ring 22 be lower than that of the wafer 10. The conductive ring 22 can be changed to another one having an electrical resistance suitable for that of the wafer 10. (Column 10 lines 32-40)

**Further, only the surface of the ring 22 can be formed of the conductive material. In other words, a ring formed of insulating material on the surface of**

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***which a conductive film is formed, can be used as a conductive ring.*** In the present invention, such a ring is also referred to as a conductive ring. In this case, however, the surface of the ring has to electrically contact a susceptor 14. (Column 10 lines 41-48)

A wafer formed of polysilicon, monocrystalline silicon, amorphous silicon, or the like can be used as a substrate or an object to be processed. (Column 49-52)

The present invention is not always applied to the magnetron plasma etching apparatus but can be applied to another magnetron plasma processing apparatus such as a plasma CVD apparatus. (Column 10 lines 54-57)

***As seen in Fig. 3 the pedestal is biased to a first power with RF source and the second region of the chamber is grounded.*** (See Fig. 3)

Inherently the chamber of Fig. 3 could be utilized for plasma CVD depending on the selection of gases utilized. Hasegawa et al. recognize that magnetron plasma CVD is possible. (See Column 10 lines 54-57; Column 1 lines 10-19)

Inherently the sputtering apparatus includes a target for deposition of a film layer. Hasegawa et al. recognizes magnetron plasma sputtering apparatus and film formation. (Column 1 lines 10-19; Column 2 lines 23-27) (Yamagami et al. is evidence of a conventional magnetron plasma sputtering apparatus. In Figure 7 for instance a magnetron target for a magnetron plasma sputtering apparatus is shown)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 35 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (U.S. Pat. 5,271,788) (Evidence document Yamagami et al. (U.S. Pat. 5,316,645)) in view of Armstrong et al. (U.S. Pat. 5,482,612).

Hasegawa et al. is discussed above and all is as applies above. (See Hasegawa et al. discussed above) (Yamagami et al. is discussed above as evidence of target use in a sputtering apparatus)

The differences between Hasegawa et al. and the present claims is that providing the Al coating on the insulating ring by flame spraying is not discussed.

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Armstrong et al. teach flame-spraying aluminum on components in a sputtering chamber in order to extend the lifetime of the components. (Column 4 lines 14-31)

The motivation for flame spraying the Al coating is that it allows for extending the lifetime of the component in the sputtering chamber. (Column 4 lines 14-31)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Hasegawa et al. by flame spraying aluminum on components in a sputtering chamber as taught by Armstrong et al. because it allows for extending the lifetime of the component in the sputtering chamber.

Claims 36, 52 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (U.S. Pat. 5,271,788) (Evidence document Yamagami et al. (U.S. Pat. 5,316,645)) in view of Douglas (U.S. Pat. 4,999,320).

Hasegawa et al. is discussed above and all is as applies above. (See Hasegawa et al. discussed above) (Yamagami et al. is discussed above as evidence of target use in a sputtering apparatus)

The differences between Hasegawa et al. and the present claims is that where the insulating ring is a ceramic or dielectric is not discussed.

Douglas teach a cathode 16 with a conductor 46 having an insulating rim 48 coated with a grounded conductor 50. Insulated rim 48 may comprise, for example, Teflon or **ceramic (A ceramic is inherently a dielectric)**, while conductive layer 46 may comprise, for example, aluminum. (Column 3 lines 56-66)

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The motivation for utilizing a ceramic (i.e. dielectric) is that it allows for suppressing ionization avalanches. (Column 2 lines 38-42)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Hasegawa et al. by utilizing a ceramic (i.e. a dielectric) as taught by Douglas because it allows for suppressing ionization avalanches.

Claims 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (U.S. Pat. 5,271,788) (Evidence document Yamagami et al. (U.S. Pat. 5,316,645)) in view of Uzoh et al. (U.S. Pat. 6,140,234)

Hasegawa et al. is discussed above and all is as applies above. (See Hasegawa et al. discussed above) (Yamagami et al. is discussed above as evidence of target use in a sputtering apparatus)

The differences between Hasegawa et al. and the present claims is that barrier layer sputtering of layers containing tantalum is not discussed.

Uzoh et al. teach that sputtering can be utilized to form barrier layers of tantalum nitride and tantalum before copper metallization. (Column 3 lines 40-47)

The motivation for utilizing tantalum containing materials as barrier layers produced by sputtering is that it reduces dishing and minimizes any erosion of dielectric materials. (Column 2 lines 22-25)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Hasegawa et al. by utilizing sputtering to form barrier layers of tantalum nitride and tantalum before copper metallization as



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taught by Uzoh et al. because it reduces dishing and minimizes any erosion of dielectric materials,

Claims 47 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (U.S. Pat. 5,271,788) (Evidence document Yamagami et al. (U.S. Pat. 5,316,645)) in view of Moslehi (U.S. Pat. 6,132,805).

Hasegawa et al. is discussed above and all is as applies above. (See Hasegawa et al. discussed above) (Yamagami et al. is discussed above as evidence of target use in a sputtering apparatus)

The differences between Hasegawa et al. and the present claims is that arc spraying is not discussed.

Moslehi teaches arc spraying a chamber component to reduce particle generation and extend lifetime. (Column 7 lines 15-20)

The motivation for arc spraying is that it allows for reducing particle generation and extending lifetime. (Column 7 lines 15-20)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Hasegawa et al. by utilizing arc spraying of chamber components as taught by Moslehi because it allows for reducing particle generation and extending lifetime.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 703-308-3807. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 703-308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
August 27, 2003